Acta Biologica Szeged 18 (1—4), pp. 93—116 (1972)

SCREENING FOR ANTIBACTERIAL, ANTIFUNGAL AND ANTIPHAGE SUBSTANCES IN HIGHER PLANTS

L. FERENCZY,* J. ZSOLT* and JUDITH LANTOS**

*Department of Microbiology, Attila József University, Szeged
**Public Health and Epidemiological Station, Szeged

(Received January 10, 1972)

Introduction

In continuation of our previous screening program for antimicrobial substances of plant origin (FERENCZY and GRACZA, 1957; STEFANDEL, 1961; FERENCZY, HORVÁTH and ZSOLT, 1966; HORVÁTH, 1967), leaves of higher plants were tested for the occurrence of antibacterial, antifungal and antiphage activity. The main objective of the present study was to find new sources of inhibitory compounds.

Materials and Methods

Plants. — Most of the plants, in the flowering state, were collected from natural habitats in Hungary; the other specimens were obtained from the University Botanical Garden in Szeged. The fresh leaves were separated from the other organs, dried immediately at 80°C with the use of infrared heaters, ground to fine powder, and tested for antimicrobial activity within two weeks. In each case at least three individual specimens were collected, treated and examined separately.

Wherever possible, the nomenclature suggested by Soó (1964—70) has been followed.

Test organisms. — Bacteria: *Bacillus cereus* var. *mycoides, Staphylococcus aureus, Escherichia coli* O 111, *Serratia marcescens.* Fungi: *Hansenula anomala, Candida albicans, Syncephalastrum racemosum, Aspergillus niger.* Phages and their indicator bacteria: staphylococcus phage 3A NCTC 8408 and *Staphylococcus aureus* 3A NCTC 8319; anthrax phage w/α and *Bacillus anthracis* VR; coli phage T_2 and *E. coli* B.

Antibacterial and antifungal tests. — A thick suspension was made from 0.5 g powdered leaves by adding 2.5 ml phosphate buffer (M/5, pH 7.0), mixing, keeping at 100°C for 5 min, then cooling to room temperature. In previous experiments it was proved that survivors of the heat treatment in the plant material, e. g. spore-forming bacteria, could not influence the results in the case of fast-growing test organisms.

The surfaces of solidified agar media (broth supplemented with 1% glucose and 2% agar, pH 7.0) in Petri dishes were inoculated with suspensions

of fresh cultures of bacteria, yeasts and one-week old conidia of the filamentous fungi, in each case containing approximately 10^8 cells/ml. The excess suspension was removed, the surface was dried, and piles of the thick suspension of plant material, 10—12 mm in diameter, were placed on the agar. The dishes were incubated at 30°C for 20 hours (with *Aspergillus* for 30 hours) and then examined for zones of inhibition. The zone-width was measured from the edge of the plant material to the edge of the zone.

Antiphage tests. — In every case 1 g plant material was extracted with 10 ml saline by keeping the mixture at 100°C for 5 min. The extract was filtered through filter paper, the pH was adjusted to 7.0 by addition of 0.1 N NaOH or HCl, and then the solution was filtered through sintered glass to exclude any bacterial contamination.

Phage suspensions (10^7 phages/ml) were prepared (ADAMS, 1959), mixed with plant extracts (0.5 ml : 0.5 ml) and incubated at 37°C for 60 min. Saline was used in the controls instead of plant extract. Indicator bacteria (5×10^7—10^8/ml) were layered onto broth agar (BLAIR and WILLIAMS, 1961). Ten-fold dilution series were made from the phage suspensions with saline and 1 cm^2 areas were inoculated with 20 μl portions of the corresponding phages. The plates were incubated at 30°C for 20 hours, then examined for plaques. A decrease of two orders of magnitude in the number of plaques was considered significant.

Results and discussion

The plants containing antibacterial, antifungal or antiphage substances are presented in Table I, together with their activities.

Of the 1365 plant species (belonging to 138 families) tested, 480 (belonging to 89 families) proved active against one or more microorganisms (35.2%).

One or both Gram-positive bacteria were found selectively inhibited by 230 species (16.8%). No case was recorded of definite selective activity againts Gram-negative bacteria.

Both Gram-positive and Gram-negativ bacteria were inhibited in 36 cases (2.6%).

The presence of selective antifungal compounds could be detected in 93 plant species (6.8%).

Extracts of 52 of the examined 508 species (10.2%) significantly or completely inactivated on or more types of phages.

No close correlation could be shown between the taxonomical positions of the plants and the occurrence of antibacterial and antiphage compounds. On the other hand, the distribution of selective antifungal compounds is narrower and confined to a few families.

Interestingly enough, a considerable antiphage activity was not associated in general with significant antibacterial or antifungal effects.

If the proportions of active and inactive plant species found in our survey are compared with the results of earlier screening programs carried out in different parts of the world (for references, see: SKINNER, 1955; DUQUÉNOIS, 1955; DUQUÉNOIS, 1958; NICKELL, 1959), fairly close similarities can be found in the proportional occurrence of antibacterial activity but as regards antifungal

activity the picture is somewhat different. It is not possible at present to compare the occurrence of antiphage compounds because of the lack of previous data in this field.

Summary

Extracts of 1365 plant species belonging to 138 families were tested for antibacterial and antifungal activity and 508 species for antiphage activity, with two Gram-positive and two Gram-negative bacteria, two yeasts, two moulds and three phages. Of the plant species examined, 480 (35.2%) proved active against one or more microorganisms. One or both Gram-positive bacteria were selectively inhibited by preperations of 230 plant species (16.8%). No definite selective inhibition was detected with Gram-negative bacteria. Both Gram-positive and Gram-negative bacteria were inhibited in 36 cases (2.6%). The presence of selective antifungal substances could be shown in 93 plant species (6.8%). Extracts of 52 of the examined 508 species (10.2%) significantly or completely inactivated one or more types of phages.

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Table 1. Activities of leaf-extracts against bacteria, fungi and phages

Bm = *Bacillus cereus* var. *mycoides;* Sa = *Staphylococcus aureus;* Ec = *Escherichia coli* 0 111; Sm = *Serratia marcescens;* Ha = *Hansenula anomala;* Ca = *Candida albicans;* Sr = *Syncephalastrum racemosum;* An = *Aspergillus niger;* 3A = staphylococcus phage 3A; wα = anthrax phage w/α; T2 = coli phage T_2.

n = number indicating average width of zone of inhibition in mm; values for all samples lie in the range n ± 2 mm; sharply defined zone and complete inhibition,
n_v = the same as above, but the range broader than n ± 2 mm („variable values"),
n_z = the same as in the first case, but inactive samples also occur („zero values"),
n^p = the same as the first case, but the inhibition is partial,
+ = the zone of inhibition is less than 3 mm and not sharply defined,
A = at least two orders of magnitude reduction in phage titre,
B = complete inactivation of phages; no plaques,
O = no zones of inhibition; no or not significant reduction in phage titre,
— = not tested.

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
GYMNOSPERMAE											
Araucariaceae											
Araucaria											
excelsa	2	3	0	0	+	2	0	0	—	—	—
Cupressaceae											
Biota											
orientalis	6	3	0	0	0	0	0	0	—	—	—
Chamaecyparis											
lawsoniana	5	3	0	0	0	0	0	0	—	—	—
l. stewartii	2	0	0	0	0	0	0	0	—	—	—
l. thuoides	2	0	0	0	0	0	0	0	—	—	—
pisifera	2	+	0	0	0	0	0	0	—	—	—
Cupressus											
macrocarpa	2	3	0	0	0	0	0	0	—	—	—
sempervirens	2	0	0	0	0	0	0	0	—	—	—
Juniperus											
communis	2_z	2_z	0	0	0	0	0	0	—	—	—
sabina	2_z	2_z	0	0	0	0	0	0	—	—	—
virginiana	2_z	0	0	0	0	0	0	0	—	—	—
Thuja											
occidentalis	3_z	3_z	0	0	0	0	0	0	—	—	—
o. ellwangeriana	2	+	0	0	0	+	+	+	—	—	—
o. malonyana	0	0	0	0	+	2	2	0	—	—	—
o. wareana	2	0	0	0	0	0	0	0	—	—	—
plicata	3	2	0	0	0	0	0	0	—	—	—
p. variegata	+	+	0	0	0	0	0	0	—	—	—
Pinaceae											
Abies											
alba	2	+	0	0	0	0	0	0	—	—	—
concolor	5	3	0	0	0	0	0	0	—	—	—
c. violacea	3	3	0	0	0	0	0	0	—	—	—
nordmanniana	3	2	0	0	0	0	0	0	—	—	—
numilata	3	2	0	0	0	0	0	0	—	—	—
pardei	2	2	0	0	0	0	0	0	—	—	—
religiosa	2	3	0	0	0	0	0	0	—	—	—
sibirica	3	+	0	0	0	0	0	0	—	—	—
Larix											
decidua	4	3	0	0	0	0	0	0	—	—	—
Picea											
abies	3	3	3^p	0	0	0	0	0	—	—	—
omorika	3	+	0	0	0	0	0	0	—	—	—
orientalis	3	2	0	0	0	0	0	0	—	—	—
pungens	2	2	0	0	0	0	0	0	—	—	—
Pinus											
divaricata	3	2	0	0	0	0	0	0	—	—	—
griffithii	3	0	0	0	0	0	0	0	—	—	—
mugo	2_z	2_z	0	0	0	0	0	0	—	—	—
nigra	2_z	2_z	0	0	0	0	0	0	—	—	—
peuce	3	2	0	0	0	0	0	0	—	—	—
pinaster	2	0	0	0	0	0	0	0	—	—	—
silvestris	2	2	0	0	0	0	0	0	—	—	—
Pseudotsuga											
menziesii	2	2	0	0	0	0	0	0	—	—	—
Tsuga											
canadensis	5	+	0	0	0	0	0	0	—	—	—
Podocarpaceae											
Podocarpus											
falcatus	3_z	2_z	0	0	3_z	3_z	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Taxaceae											
Taxus											
baccata	+	0	0	0	0	0	0	0	—	—	—
b. brevifolia	0	0	0	0	2	2	0	0	—	—	—
Taxodiaceae											
Cryptomeria											
japonica	2	0	0	0	0	0	0	0	—	—	—
Cunninghamia											
lanceolata	2	0	0	0	0	0	0	0	—	—	—
Metasequoia											
glyptostroboides	2	2	0	0	0	0	0	0	—	—	—
Sequoia											
sempervirens	2	+	0	0	0	0	0	0	—	—	—
wellingtonia	2	2	0	0	0	0	0	0	—	—	—
Taxodium											
distichum	3	0	0	0	0	0	0	0	—	—	—
ANGIOSPERMAE											
Aceraceae											
Acer											
campestre	4_z	4_z	0	0	3_z	+	3_z	0	A	0	0
cappadocicum	0	0	0	0	0	0	2	0	0	0	0
ginnala	3	0	0	0	+	0	0	0	A	0	0
palmatum	3	0	0	0	0	0	0	0	0	0	0
platanoides	2_z	2_z	0	0	2_z	0	3_z	0	0	0	0
pseudo-platanus	4_v	3_v	0	0	3_v	+	3_v	0	—	—	—
rubrum	3	0	0	0	0	0	0	0	0	0	0
saccharinum	5_v	5_v	3_z	0	0	0	0	0	—	—	—
tataricum	4_v	4_v	0	0	2_v	0	2_v	0	B	B	B
Amaranthaceae											
Amaranthus											
albus	0	0	0	0	6_z	0	0	0	0	0	0
Celosia											
cristata	0	0	0	0	+	0	+	0	0	0	0
Amaryllidaceae											
Agave											
leptonseacantha	2	0	0	0	5	3	5	0	—	—	—
Hippeastrum											
vittatum	0	0	0	0	2	0	0	0	—	—	—
Anacardiaceae											
Cotinus											
coggygria	3_z	3_z	0	0	0	0	0	0	A	0	0
Rhus											
scopolium	2	3	0	0	0	0	0	0	—	—	—
hirta	2	+	0	0	0	0	0	0	A	A	0
Anemonaceae											
Anemone											
barbulata	0	0	0	0	2	0	0	0	0	0	0
coronaria	0	0	0	0	4	+	2	0	0	0	0
cylindrica	0	0	0	0	5	3	2	0	0	0	0
rivularis	0	0	0	0	4_v	2_z	10_v	0	0	0	0
Clematis											
heracleifolia	0	0	0	0	+	0	+	0	0	0	0
recta	0	2	0	0	0	0	10	0	A	0	0
vitalba	0	0	0	0	2	0	0	0	0	0	0
Pulsatilla											
grandis	0	0	0	0	12_v	0	6_v	0	—	—	—
hungarica	0	0	0	0	5_v	0	12_v	0	—	—	—
nigricans	15_z	20_z	16_z	12_z	30_z	25_z	40_z	7_z	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Ranunculus											
repens	7_z	3_z	4_z	4_z	0	0	0	0	—	—	—
Apiaceae											
Bupleurum											
rotundifolium	3	0	0	0	3	0	5	0	0	0	0
Danaa											
cornubiensis	0	0	0	0	3	0	4	0	—	—	—
Daucus											
carota	+	0	0	0	0	0	0	0	—	—	—
Eryngium											
campestre	0	0	0	0	0	0	+	0	—	—	—
planum	0	0	0	0	3_z	2_z	2_z	0	—	—	—
Orlaya											
grandiflora	2	0	0	0	0	0	0	0	—	—	—
Sanicula											
europaea	0	0	0	0	3	2	5	0	—	—	—
Aquifoliaceae											
Ilex											
aquifolium	0	0	0	0	3_z	0	3_z	0	—	—	—
Araceae											
Zanthedeschia											
aethiopica	0	0	0	0	0	0	3	0	0	0	0
Araliaceae											
Fatshedera											
lizei	3	0	0	0	7	2	3	0	0	0	0
Fatsia											
japonica	3_z	2_z	0	0	3	2	4	0	—	—	—
Hedera											
helix	3_v	3_v	0	0	5_v	3_v	4_v	0	0	0	0
Aristolochiaceae											
Aristolochia											
clematitis	5	3	0	0	0	0	0	0	0	0	0
durior	3_z	0	0	0	0	0	0	0	—	—	—
Asarum											
europaeum	4_v	3_v	0	0	0	0	0	0	0	0	0
Asclepidaceae											
Cynanchum											
medium	0	0	0	0	6_v	6_v	6_v	2_v	0	0	0
nigrum	0	0	0	0	6_v	6_v	6_v	3_v	—	—	—
pannonicum	0	0	0	0	7_v	7_v	7_v	3_v	—	—	—
vincetoxicum	0	0	0	0	7_v	7_v	7_v	3_v	0	0	0
Asteraceae											
Achillea											
kitaibeliana	3	+	0	0	0	0	0	0	0	0	0
Anaphalis											
margaritacea	5	+	0	0	0	0	0	0	0	0	0
Arctium											
lappa	10_v	2_v	0	0	0	0	0	0	0	0	0
tomentosum	3	+	0	0	0	0	0	0	—	—	—
Arctotis											
grandis	2	+	0	0	0	0	0	0	0	0	0
Artemisia											
dracunculus	2	0	0	0	0	0	0	0	—	—	—
vulgaris	3_z	0	0	0	0	0	0	0	0	0	0
Aster											
dumosus	0	0	0	0	0	0	0	0	A	0	0
tongotensis	0	0	0	0	3_z	2_z	2_z	0	0	0	0
Bellis											
perennis	0	0	0	0	3	+	2	0	—	—	—
p. hortensis	0	0	0	0	4	+	2	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3 A	wα	T2
Centaurea											
banatica	4	4	3	4	0	0	0	0	—	—	—
micranthos	2	3	3	3	0	0	0	0	0	0	0
minus	2	+	0	0	0	0	0	0	—	—	—
sadleriana	6_v	3_v	0	0	0	0	0	0	0	0	0
scabiosa	5	3	0	0	0	0	0	0	0	0	0
spinulosa	6	4	0	0	0	0	0	0	0	0	0
stenolepis	2	0	0	0	0	0	0	0	—	—	—
Chrysanthemum											
cinerariifolium	6_v	5_v	0	0	0	0	0	0	—	—	—
corymbosum	2	8	+	0	0	0	0	0	0	0	0
leucanthemum	3_z	0	0	0	0	0	0	0	0	0	0
parthenium	3_v	4_v	0	0	0	0	0	0	0	0	0
Cnicus											
benedictus	5_v	6_v	3_v	7_v	0	0	0	0	—	—	—
Coreopsis											
douglasii	0	8	0	0	0	3^p	12	0	0	0	0
Doronicum											
hungaricum	3	4	0	0	0	0	0	0	—	—	—
orphanides	3	3	0	0	0	0	0	0	—	—	—
pardalianches	5	5	0	0	0	0	0	0	—	—	—
Erigeron											
acris	0	0	3^p	0	0	0	0	0	—	—	—
Gnaphalium											
lanatum	5	5^p	3^p	0	0	0	0	0	—	—	—
Helichrysum											
arenarium	3	3	0	0	0	0	0	0	—	—	—
Homolanthus											
populifolius	3	3	3^p	0	0	0	0	0	—	—	—
Inula											
helenium	6_z	5_z	0	0	0	0	0	0	—	—	—
Lindheimera											
texana	3^p	0	0	0	0	0	0	0	—	—	—
Matricaria											
africana	3	0	0	0	0	0	0	0	—	—	—
grandiflora	5	7	0	0	0	0	2	0	—	—	—
Onopordum											
acanthium	8	6	0	0	0	0	0	0	—	—	—
Pyrethrum											
parthenifolium	5_v	0	0	0	0	0	0	0	—	—	—
Santolina											
chamaecyparissus	3^p	0	0	0	0	0	0	0	—	—	—
Schkuhria											
abrontanoides	6	0	0	0	0	0	0	0	—	—	—
Senecio											
doria	0	0	0	0	0	0	0	0	A	A	0
viscosus	4_v	4_v	0	0	0	0	0	0	—	—	—
Serratula											
lycopifolia	2	2	0	0	0	0	0	0	—	—	—
Solidago											
virga-aurea	0	0	0	0	0	0	5_z	0	—	—	—
Sonchus											
oleraceus	0	0	0	0	0	0	0	0	A	0	0
Tagetes											
tenuifolius	2	0	0	0	0	0	0	0	0	0	0
Telekia											
speciosa	2	0	0	0	0	0	0	0	—	—	—
Xanthium											
italicum	10_v	8_v	0	0	3_v	3_v	4_v	4_v	0	0	0
spinosum	6	3	0	0	+	+	+	+	0	0	0

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Zinnia											
peruviana	7	5	0	0	0	0	3^{p}	0	—	—	—
Balsaminaceae											
Impatiens											
glandulifera	5^{p}	0	0	0	+	+	0	0	—	—	—
Begoniaceae											
Begonia											
rex	3	0	0	0	0	0	0	0	0	0	0
Berberidaceae											
Berberis											
brachypoda	3	0	0	0	0	0	0	0	—	—	—
silvatarancana	4_{v}	0	0	0	0	0	0	0	—	—	—
thunbergii	3	0	0	0	0	0	0	0	—	—	—
Epimedium											
niveum	0	0	0	0	0	0	0	0	A	B	B
Mahonia											
aquifolium	0	0	0	0	5_{z}	5_{z}	0	0	—	—	—
Betulaceae											
Alnus											
glutinosa	3_{z}	2_{z}	0	0	0	0	0	0	—	—	—
rubra	4_{v}	3_{v}	4_{z}^{p}	0	0	0	3	0	—	—	—
rugosa	2_{z}	2_{z}	0	0	0	0	0	0	—	—	—
Betula											
pendula	4	2	0	0	0	0	0	0	0	0	0
pubescens	3	2	0	0	0	0	0	0	—	—	—
Carpinus											
betulus	5_{z}	3_{z}	5_{z}^{p}	0	0	0	6_{z}^{p}	0	A	0	A
Corylus											
avellana	0	0	0	0	0	0	0	0	A	A	B
Bignoniaceae											
Catalpa											
bignonioides	3	+	3	0	0	0	0	0	0	0	0
crusoscos	2	0	0	0	0	0	5^{p}	0	—	—	—
Jacaranda											
mimosaefolia	4_{z}	3_{z}	0	0	0	0	0	0	—	—	—
Boraginaceae											
Alkanna											
tinctoria	2	+	0	0	0	0	2	0	0	0	0
Cynoglossum											
hungaricum	0	0	0	0	0	0	+	0	0	0	0
Echium											
vulgare	0	0	0	0	0	+	0	0	0	0	0
Ehretia											
thyrsiflora	0	0	3^{p}	0	0	0	3	0	0	0	0
Heliotropium											
peruvianum	0	0	+	0	0	0	0	0	—	—	—
Lithospermum											
arvense	4_{z}	2_{z}	0	0	6_{z}	0	0	0	—	—	—
Nonea											
pulla	0	0	0	0	0	0	3_{z}	0	0	0	0
Brassicaceae											
Arabis											
turrita	6_{z}	4_{z}	0	0	0	0	0	0	0	0	0
vachinensis	3	2	0	0	0	0	0	0	0	0	0
Barbarea											
vulgaris	2_{z}	2_{z}	0	0	0	0	0	0	—	—	—
Calepina											
irregularis	10_{z}	10_{z}	3_{z}^{p}	3_{z}	5_{z}	0	0	0	0	0	0

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Capsella											
bursa-pastoris	2_z	2_z	0	0	0	0	0	0	0	0	0
Cheiranthus											
cheirii	4_z	4_z	$+_z$	3	4_z	$+_z$	0	0	—	—	—
Diplotaxis											
tenuifolia	6	4	0	0	0	0	0	0	—	—	—
Erysimum											
allionii	3	2	0	0	0	0	0	0	—	—	—
arhantanum	12	4	0	0	0	0	0	0	—	—	—
aureum	10_z	4_z	0	0	0	0	0	0	—	—	—
diffusum	10	8	4^p	0	0	0	0	0	—	—	—
dubium	10	10	2	2	0	0	0	0	—	—	—
erysimoides	4	6	2	+	10	7	3	0	—	—	—
odoratum	14	8	+	3	0	0	0	0	—	—	—
parmonicum	3	5	+	+	3	0	0	0	—	—	—
wahlenbergii	+	+	0	0	0	0	0	0	—	—	—
wittmannii	5	3	2	+	6	4	0	0	—	—	—
Hesperis											
tristis	7_v	5_v	0	0	0	0	0	0	—	—	—
Isatis											
aleppica	6_v	5_v	0	0	0	0	0	0	—	—	—
glauca	9_v	7_v	0	0	0	0	0	0	—	—	—
tinctoria	6	5^p	0	0	0	0	0	0	—	—	—
trachycarpa	7	5	0	0	0	0	0	0	—	—	—
Lepidium											
campestre	2	+	0	0	0	0	0	0	—	—	—
draba	3	+	0	0	3	0	0	0	—	—	—
Rorippa											
austriaca	8	3	0	0	0	0	0	0	—	—	—
Sinapis											
arvensis	3	0	0	0	0	0	0	0	0	0	0
Thlaspi											
perfoliatum	10_v	10_v	0	0	0	0	0	0	—	—	—
Turritis											
glabra	5_v	5_v	0	0	0	0	0	0	—	—	—
Buxaceae											
Buxus											
microphyllum	0	0	0	0	3_z	3_z	3_z	3_z	—	—	—
sempervirens	0	0	0	0	3_z	4_z	3_z	3_z	0	0	0
Caesalpiniaceae											
Cercis											
chuadentis	0	0	0	0	0	0	0	0	B	B	B
siliquastrum	0	0	0	0	0	0	0	0	A	0	0
Calycanthaceae											
Calycanthus											
occidentalis	2_z	0	0	0	0	0	0	0	0	0	0
Campanulaceae											
Platycodon											
grandiflorum	5	2	0	0	0	0	0	0	—	—	—
Cannabinaceae											
Cannabis											
sativa	8_z	7_z	0	0	0	0	0	0	—	—	—
Humulus											
lupulus	4_z	2_z	0	0	0	0	0	0	—	—	—
Caprifoliaceae											
Leycesteria											
formosa	4	2	0	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Lonicera											
chatocarpa	4	0	0	0	0	0	0	0	—	—	—
tatarica	2	0	0	0	0	0	0	0	—	—	—
Sambucus											
ebulus	2_z	0	0	0	0	0	0	0	—	—	—
Symphoricarpus											
racemosus	3	0	0	0	0	0	0	0	—	—	—
Viburnum											
lantana	2_z	2_z	0	0	0	0	0	0	0	0	0
opulus roseum	2_z	4_z	0	0	0	0	0	0	—	—	—
Weigela											
praecox	2_z	2_z	0	0	0	0	0	0	—	—	—
Caryophyllaceae											
Lychnis											
chalcedonica	0	0	0	0	3	0	3	0	—	—	—
Saponaria											
ocymoides	0	0	0	0	2	0	3	0	0	0	0
officinalis	+	0	0	0	+	0	+	0	0	0	0
Silene											
cucubalus	0	0	0	0	2_z	0	$+_z$	3_z	0	0	0
Cercidiphyllaceae											
Cercidiphyllum											
japonicum	4_v	4_v	0	0	0	0	0	0	—	—	—
Chenopodiaceae											
Chenopodium											
album	0	0	+	0	0	0	0	0	0	0	0
hybridum	+	0	0	0	3^p	3	0	0	0	0	0
schroederianum	2	0	0	0	0	0	0	0	—	—	—
Cistaceae											
Fumana											
vulgaris	0	0	0	0	0	+	0	0	0	0	0
Helianthemum											
ovatum	2_z	2_z	+	0	0	0	0	0	0	0	0
Convolvulaceae											
Cuscuta											
obtusifolia	2	3	0	0	0	0	0	0	0	0	0
Cornaceae											
Cornus											
baylei	3_v	2_v	0	0	2_v	0	3_v	0	—	—	—
sanguinea	0	0	0	0	0	0	0	0	A	0	0
Crassulaceae											
Sedum											
rupestre	2	4	0	0	0	0	0	0	—	—	—
Cucurbitaceae											
Colocynthis											
citrullus	2	2	0	0	0	0	0	0	—	—	—
Ecballium											
elaterium	0	0	0	0	0	+	0	0	0	0	0
Cyperaceae											
Carex											
pseudocyperus	3	0	0	0	0	0	0	0	0	0	0
Dioscoreaceae											
Tamus											
communis	0	0	0	0	3_z	0	+	0	0	0	0
Dipsacaceae											
Knautia											
drymeia	0	0	0	0	3	0	+	0	—	—	—
Succisa											
pratensis	2_z	0	0	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Ebenaceae											
Diospyros											
lotus	3	3	0	0	2	0	0	0	—	—	—
Eleagnaceae											
Hippophaë											
rhamnoides	0	2	0	0	0	0	0	0	—	—	—
Euphorbiaceae											
Euphorbia											
lucida v. salicifolia	3	0	0	0	0	0	0	0	—	—	—
palustris	4	3	0	0	0	0	0	0	—	—	—
polychroma	3	2	0	0	0	0	0	0	—	—	—
salicifolia	2	0	0	0	0	0	0	0	—	—	—
segueriana	4	0	0	0	0	0	0	0	—	—	—
virgata	2	0	0	0	0	0	0	0	—	—	—
Fabaceae											
Amorpha											
fructicosa	2_z	0	0	0	0	0	0	0	0	0	0
Astragalus											
cicer	2_z	0	0	0	0	0	0	0	0	0	0
gummifera	+	+	0	0	0	0	0	0	—	—	—
Genista											
pilosa	2	0	0	0	0	0	0	0	—	—	—
tinctoria	3_z	+	0	0	0	0	0	0	—	—	—
Robinia											
ambigua	+	3	0	0	0	0	0	0	—	—	—
Wistaria											
sinensis	5	3	0	0	0	0	0	0	—	—	—
Fagaceae											
Castanea											
sativa	2	3	0	0	0	0	0	0	0	0	0
Fagus											
silvatica	0	0	0	0	0	0	0	0	A	A	0
Quercus											
albus	4	4	0	0	0	0	0	0	—	—	—
borealis	2	5	0	0	0	0	0	0	—	—	—
cerris	4_z	3_z	0	0	0	0	0	0	—	—	—
lyrata	+	2	0	0	0	0	0	0	—	—	—
macrocarpa	3	+	0	0	0	0	0	0	A	0	0
primus	0	0	0	0	0	0	0	0	A	0	0
robur	2_z	3_z	0	0	0	0	0	0	0	0	0
Gentianaceae											
Blackstonia											
acuminata	2	+	0	0	0	0	0	0	0	0	0
Centaurium											
vulgare	4_v	3_v	0	0	0	0	0	0	0	0	0
Geraniaceae											
Geranium											
sanguineum	3_z	3_z	3^p_z	$+_z$	0	4_z	4_z	0	0	0	0
Grossulariaceae											
Ribes											
americanum	2_z	$+_z$	0	0	0	0	0	0	—	—	—
aureum	2_z	2_z	$+_z$	0	0	2_z	0	0	—	—	—
Helleboraceae											
Helleborus											
dumetorum	0	0	0	0	5_z	$+_z$	4_z	0	—	—	—
purpurascens	0	0	0	0	4_z	+	3	0	—	—	—
Nigella											
arvensis	2_z	0	0	0	0	0	0	0	0	0	0

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Hippocastanaceae											
Aesculus											
carnea	+	0	0	0	3	0	3	0	0	0	0
hippocastanum	+	0	0	0	2_z	0	2_z	0	—	—	—
Hypericaceae											
Hypericum											
hircinum	6	10	0	0	0	0	0	0	A	0	A
moschatum	2_v	4_v	0	0	0	0	0	0	A	B	B
olympicum	2	+	0	0	0	0	0	0	—	—	—
perforatum	3_v	2_v	0	0	0	0	0	0	—	—	—
Juglandaceae											
Carya											
illinoiensis	5	5	0	0	2	2	0	0	—	—	—
peau	8	6	0	0	2	2	0	0	—	—	—
Juglans											
regia	6_z	4_z	0	0	0	3_z	0	3_z	—	—	—
nigra	2	3	0	0	0	3	0	3	—	—	—
Pterocarya											
stenoptera	3_z	2_z	0	0	0	0	0	0	—	—	—
Lamiaceae											
Ajuga											
genevensis	0	0	0	0	0	0	0	0	A	A	A
Coleus											
scutellarioides	3_v	5_v	0	0	0	0	0	0	0	0	0
Dracocephalus											
rupestre	2	0	0	0	0	0	0	0	0	0	0
Horminum											
pyrenaicum	2	3	0	0	0	0	0	0	0	0	0
Hysoppus											
officinalis	0	0	0	0	+	0	0	0	0	0	0
Majoranna											
hortensis	3	0	0	0	0	0	0	0	—	—	—
Melissa											
officinalis	3_z	0	0	0	0	0	0	0	A	0	0
Melittis											
melissophyllum	4_z	0	0	0	0	0	0	0	—	—	—
Mentha											
verticillata	0	0	0	0	0	0	0	0	A	0	A
Monarda											
didyma	3^p	3	0	0	0	0	0	0	A	0	0
pectinata	0	0	0	0	0	0	0	0	A	0	0
Ocymum											
basalicum	3_z	2_z	0	0	0	0	0	0	—	—	—
Perovskia											
abratanioides	6	2	0	0	0	0	0	0	—	—	—
Prunella											
crepis	0	0	0	0	3	0	+	0	—	—	—
vulgaris	0	0	0	0	2	0	0	0	0	0	0
Rosmarinus											
officinalis	2_z	3_z	0	0	0	0	0	0	—	—	—
Salvia											
officinalis	3	2	0	0	0	0	0	0	0	0	0
verbenaca	3	+	0	0	0	0	0	0	—	—	—
Satureja											
hortensis	3	0	0	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Liliaceae											
Allium											
montanum	3_v	0	0	0	7_v	4_v	6_v	0	0	0	0
rubrum	2_v	0	0	0	4_v	2_v	6_v	0	0	0	0
scorodoprasum	0	0	0	0	6_v	2_v	7_v	0	0	0	0
Anthericum											
ramosum	0	0	0	0	7_v	+	8_v	0	—	—	—
Asparagus											
officinalis	0	0	0	0	5_v	3_v	6_v	0	0	0	0
Aspidistra											
elatior	0	0	0	0	6	3	6	0	—	—	—
Chlorophytum											
comosum	0	0	0	0	3	0	3	0	—	—	—
Convallaria											
majalis	0	0	0	0	3_z	0	2_z	0	—	—	—
Hosta											
coerulea	0	0	0	0	7_v	2_v	7_v	0	0	0	0
plantaginea	0	0	0	0	7_v	5_v	6_v	0	—	—	—
Majanthemum											
bifolium	0	0	0	0	3_v	+	5_v	0	—	—	—
Paris											
quadrifolia	0	0	0	0	6_v	2_v	7_v	0	—	—	—
Polygonatum											
latifolium	0	0	0	0	3_z	$+_z$	4_z	0	—	—	—
multiflorum	0	0	0	0	4_z	0	4_z	0	—	—	—
odoratum	0	0	0	0	2	0	3	0	0	0	0
Rhodea											
japonica	0	0	0	0	3_v	3_v	6_v	0	—	—	—
Tulipa											
hortensis	12	7	7	10	0	0	0	0	—	—	—
Veratrum											
album	0	0	0	0	4_z	4_z	0	0	—	—	—
Yucca											
filamentosa	0	0	0	0	10_v	4_v	8_v	0	—	—	—
Lythraceae											
Lythrum											
salicaria	2_z	2_z	0	0	0	0	2_z	0	—	—	—
Liriodendron											
tulipifera	4_z	3_z	0	0	0	0	0	0	—	—	—
Magnolia											
liliiflora	3^p	+	0	0	0	0	0	0	A	0	0
Meliaceae											
Cedrela											
sinensis	0	+	0	0	0	0	0	0	0	0	0
Myrsinaceae											
Myrsine											
africana	+	5	0	0	0	0	0	0	—	—	—
Myrtaceae											
Eugenia											
myrtiflora	5	3	0	0	0	0	0	0	—	—	—
Eucalyptus											
rostratus	3	3	0	0	0	0	0	0	—	—	—
Homoranthus											
populifolius	3	3	+	0	0	0	0	0	—	—	—
Myrtus											
bullata	4	6	0	0	0	0	0	0	—	—	—
communis	4	5	0	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Oenotheraceae											
Epilobium											
parviflorum	2	+	0	0	0	0	3	0	A	A	B
Godetia											
rubicunda	4	+	0	0	0	0	0	0	—	—	—
Lopezia											
coronata	3_v	+	0	0	0	0	0	0	—	—	—
Oenothera											
lamarckiana	2	3	0	0	0	0	4	0	B	B	B
muricata	0	0	0	0	0	0	0	0	B	B	B
Oleaceae											
Fontanesia											
fortunei	10_v	12_v	6_v	5_v	6_v	3_v	+	3^p	—	—	—
Fraxinus											
ornus	4_z	+	0	0	0	0	0	0	0	0	0
Ligustrum											
ovalifolium	2^p	2	0	0	0	0	0	0	—	—	—
Paeoniaceae											
Paeonia											
delawar	3	2	0	0	0	0	0	0	B	B	B
officinalis	2_z	2_z	0	0	0	0	0	0	0	0	0
potaninii	5	3	+	3	0	0	0	0	B	A	B
trolloidea	3	3	3^p	+	0	0	0	0	B	A	B
Papaveraceae											
Bocconia											
cordata	2_z	$+_z$	0	0	0	0	2_z	3_z	—	—	—
Chelidonium											
majus	2_z	2_z	0	0	0	0	0	0	—	—	—
Dicentra											
spectabilis	+	3	0	0	0	0	0	0	—	—	—
Pittosporaceae											
Pittosporum											
bicolor	+	0	0	0	5	3	7	0	—	—	—
cranifolium	+	0	0	0	3	+	+	0	—	—	—
undulata	0	0	0	0	8	6	8	0	—	—	—
tobira	0	0	0	0	6	3	7	0	—	—	—
Plumbaginaceae											
Armeria											
vulgaris	0	0	0	0	0	0	0	0	A	B	B
Plumbago											
europaea	10	15	3	+	15	12	12	13	A	B	B
Poaceae											
Milium											
effusum	0	0	0	0	3	0	3	0	—	—	—
Polemoniaceae											
Phlox											
paniculata	2	2	0	0	0	0	0	0	—	—	—
Polemonium											
carneum	0	0	0	0	5	3	5	0	—	—	—
coeruleum	0	0	0	0	7	4	6	0	—	—	—
pulcherrimum	0	0	0	0	5	3	5	0	—	—	—
Polygonaceae											
Emex											
spinosa	3	+	0	0	0	0	0	0	—	—	—
Polygonum											
lapathifolium	0	0	0	0	0	0	0	0	A	0	0
Rumex											
limonus	+	3	0	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Portulaccaceae											
Portulacca											
oleraceae	0	0	+	0	0	0	0	0	—	—	—
Primulaceae											
Anagallis											
arvensis	0	0	0	0	8_v	5_v	10_v	3	0	0	0
femina	0	0	0	0	10_v	7_v	10_v	0	0	0	0
Cyclamen											
purpurascens	0	0	0	0	3	0	5	0	—	—	—
persicum	0	0	0	0	2	0	2	0	—	—	—
Lysimachia											
punctata	3_z	2_z	0	0	0	0	0	0	—	—	—
vulgaris	2_z	2_z	0	0	0	0	0	0	B	B	B
Primula											
darialica	0	0	0	0	7	6	10	4^p	—	—	—
elatior	0	0	0	0	7	5	10	3^p	—	—	—
kewensis	+	0	0	0	0	0	0	0	—	—	—
obconica	0	0	0	0	6	3	5	0	—	—	—
veris	5	0	0	0	4	+	4	0	—	—	—
vulgaris	0	0	0	0	3	+	7	+	A	0	0
Samolus											
valerandi	3	0	0	0	10_v	8_v	12_v	0	—	—	—
Punicaceae											
Punica											
granatum	5	4	4^p	0	0	0	0	0	B	A	B
Resedaceae											
Reseda											
lutea	10	8	0	0	0	0	0	0	—	—	—
odorata	7	7	0	0	0	0	0	0	—	—	—
Rhamnaceae											
Ceanothus											
coeruleus	+	+	0	0	0	0	0	0	A	A	A
Frangula											
alnus	2	0	0	0	0	0	0	0	0	0	0
Rhamnus											
catharticus	3_z	2_z	0	0	0	0	0	0	—	—	—
dahurica	3	2	0	0	0	0	0	0	—	—	—
Rosaceae											
Amelanchier											
canadensis	2_z	0	0	0	0	0	0	0	—	—	—
Aruncus											
silvestris	8	3	0	0	0	0	0	0	—	—	—
Chaenomeles											
japonica	2	0	0	0	0	0	0	0	—	—	—
speciosa	0	0	0	0	0	0	0	0	A	0	0
Crataegus											
crus-galli	2	2	0	0	0	0	0	0	—	—	—
macracantha	2	0	0	0	0	0	0	0	—	—	—
monogyna	2_z	0	0	0	0	0	0	0	0	0	0
oxyacantha	2	0	0	0	0	0	0	0	—	—	—
Cydonia											
oblonga	0	0	0	0	0	0	0	0	A	0	0
Filipendula											
ulmaria	4_z	0	0	0	0	0	0	0	—	—	—
vulgaris	2	+	0	0	0	0	0	0	A	A	A
Geum											
urbanum	0	0	0	0	0	0	0	0	A	0	0
Geum											
urbanum	0	0	0	0	0	0	0	0	A	0	0

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Malus											
baccata	5_v	5_v	0	0	0	0	0	0	—	—	—
floribunda	4	3	0	0	0	0	0	0	—	—	—
prunifolia	6	5	0	0	0	0	0	0	—	—	—
pumila	2	2	0	0	0	0	0	0	—	—	—
purpurea	2_z	2_z	0	0	0	0	0	0	—	—	—
sargentii	2	0	0	0	0	0	0	0	A	0	A
Potentilla											
anserina	2_z	3_z	0	0	0	0	0	0	—	—	—
arenaria	0	0	0	0	0	0	0	0	A	0	0
nepalensis	0	0	4^p	0	0	0	0	0	0	0	0
Pyracantha											
coccinea	+	+	0	0	0	0	0	0	—	—	—
Pyrus											
communis	2	2	0	0	0	0	0	0	—	—	—
pyraster	2	2	3^p	0	2	0	0	0	0	0	0
Rosa											
pendulina	3	2	2^p	0	0	0	0	0	—	—	—
canina	3	2	3^p	0	0	0	0	0	—	—	—
rugosa	3	2	3^p	0	0	0	0	0	—	—	—
Rubus											
caesius	3_z	3_z	3^p_z	0	0	0	0	0	A	A	A
idaeus	2	+	0	0	0	0	0	0	—	—	—
Spiraea											
revisii	7	6	3^p	0	0	0	0	0	—	—	—
vanhouttei	10	2	0	0	0	0	0	0	—	—	—
watsoniana	+	+	0	0	0	0	0	0	—	—	—
Waldsteinia											
geoides	3	+	0	0	0	0	0	0	A	B	B
Rubiaceae											
Asperula											
azurea	3	0	0	0	0	0	0	0	0	0	0
Rutaceae											
Citrus											
limonum	3	0	0	0	0	0	0	0	—	—	—
Phellodendron											
amurense	5	0	0	0	0	0	0	0	0	0	0
Ruta											
graveolens	3_z	0	0	0	0	0	0	0	0	0	0
Salicaceae											
Populus											
alba	4_z	3_z	0	0	0	0	0	0	—	—	—
deltoides	3_z	0	0	0	0	0	0	0	—	—	—
geneva	2	0	0	0	0	0	0	0	—	—	—
marylandica	3_z	5_z	3^p	0	0	0	0	0	—	—	—
nigra	2_z	0	0	0	0	0	0	0	—	—	—
serotina	2_z	0	0	0	0	0	0	0	—	—	—
virginiana	5	3	0	0	0	0	0	0	—	—	—
Salix											
acutifolia	4	2	0	0	0	0	0	0	—	—	—
alba	2	0	0	0	0	0	0	0	—	—	—
amygdalina	2	0	0	0	0	0	0	0	—	—	—
cinerea	3_z	3_z	0	0	0	0	+	0	B	A	B
daphnoides	3	+	0	0	0	0	0	0	—	—	—
purpurea	2	0	0	0	0	0	3	0	—	—	—
Sapindaceae											
Koelreuteria											
paniculata	10_v	6_v	+	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Xanthoceras											
sorbifolium	0	0	0	0	2	0	4	0	0	0	0
Saxifragaceae											
Bergenia											
bifolia	4	5	0	0	0	0	0	0	—	—	—
Heuchera											
americana	4_v	3_v	0	0	0	0	0	0	A	0	0
macrophylla	+	+	0	0	0	0	+	0	B	B	B
Scrophulariaceae											
Alonsoa											
caulialata	3	+	3^p	0	0	0	0	0	0	0	0
Calceolaria											
gracilis	2	3	0	0	0	0	0	0	—	—	—
Chaenorrhinum											
minus	2	2	0	0	0	0	0	0	0	0	0
Digitalis											
amandina	0	0	0	0	6_v	+	5_v	0	—	—	—
ambigua	0	0	0	0	5_v	0	7_v	0	0	0	0
bonata	0	0	0	0	4	0	4	0	—	—	—
glutinosa	0	0	0	0	6_v	0	7_v	0	0	0	0
grandiflora	0	0	0	0	6_v	+	8_v	0	—	—	—
lutea	0	0	0	0	4	+	3	0	—	—	—
orientalis	0	0	0	0	5_v	+	5_v	0	—	—	—
parviflora	0	0	0	0	6	+	5	0	0	0	0
purpurea	0	0	0	0	4_v	+	4_v	0	0	0	0
sibirica	0	0	0	0	5_v	3_v	7_v	0	—	—	—
vitifolia	0	0	0	0	3	+	4	0	—	—	—
Mimulus											
cardinalis	2	3	0	0	0	0	0	0	—	—	—
Pentstemon											
azureus	2	+	0	0	0	0	0	0	0	0	0
barbata	3_z	2_z	0	0	0	0	0	0	—	—	—
barettae	3	+	0	0	0	0	0	0	A	A	0
hybridum	4	5	0	0	0	0	0	0	—	—	—
Rhinanthus											
minor	2	0	0	0	0	0	0	0	—	—	—
Scrophularia											
scopolii	+	0	0	0	3_z	0	2_z	0	0	0	0
Scutellaria											
altissima	3_z	0	0	0	0	0	0	0	—	—	—
Verbascum											
blattaria	2	0	0	0	0	0	0	0	—	—	—
Veronica											
anagallis-aquatica	3	0	0	0	0	0	0	0	—	—	—
anagalloides	3	0	0	0	0	0	0	0	—	—	—
austriaca	4^p	4	0	0	0	0	0	0	0	0	0
Simarubaceae											
Ailanthus											
altissima	+	0	0	0	0	0	0	0	—	—	—
Solanaceae											
Nicotiana											
affinis	0	0	0	0	5_v	+	5_v	0	0	0	0
Physalis											
alkekengi	3	+	0	0	0	0	0	0	—	—	—
franchetii	5	3	2^p	0	0	0	0	0	—	—	—
Salpiglossis											
sinuata	2	2	0	0	0	0	0	0	—	—	—

names	Bm	Sa	Ec	Sm	Ha	Ca	Sr	An	3A	wα	T2
Solanum											
dulcamara	0	0	0	0	7_v	3_v	10_v	0	—	—	—
laciniatum	0	0	0	0	5_v	3_v	6_v	0	—	—	—
luteum	0	0	0	0	3_z	2_z	5_z	0	—	—	—
nigrum	0	0	0	0	4_z	0	4_z	0	—	—	—
Staphyleaceae											
Staphylea											
pinnata	+	2	0	0	0	0	0	0	A	A	B
Styracaceae											
Halesia											
carolina	+	0	0	0	6_v	3_v	8_v	0	0	0	0
Tamaricaceae											
Tamarix											
tetrandra	+	0	0	0	0	0	0	0	—	—	—
Thymeleaceae											
Daphne											
mezereum	3	+	0	0	0	0	+	0	0	0	0
Valerianaceae											
Valeriana											
officinalis	4_z	3_z	0	0	0	0	0	0	—	—	—
Verbenaceae											
Lantana											
lilacina	3	0	0	0	0	0	0	0	0	0	0
Violaceae											
Viola											
alba	3	3	0	0	0	0	0	0	—	—	—
arvensis	2	3	0	0	0	0	0	0	—	—	—
cyanea	2	+	0	0	0	0	0	0	—	—	—
hirta	3	3	0	0	0	0	0	0	—	—	—
hispida	4	+	0	0	0	0	0	0	0	0	0
lutea	2_z	2_z	0	0	0	0	0	0	0	0	0
mirabilis	4	4	0	0	4^p	4^p	5	0	—	—	—
odorata	4	4	0	0	0	0	0	0	0	0	0
silvestris	2	2	0	0	0	0	0	0	—	—	—
Vitaceae											
Vitis											
silvestris	2	2	0	0	0	0	0	0	—	—	—
Zygophyllaceae											
Peganum											
harmala	0	0	0	0	0	+	0	0	—	—	—
Tribulus											
terrestris	2	0	0	0	6_v	2_v	4_v	0	0	0	0

The list of plant species

tested for antibacterial and antifungal activity. Asterisks indicate species which were also tested for phage inactivation

GYMNOSPERMAE

Araucariaceae: Araucaria excelsa

Cephalotaxaceae: Cephalotaxus drupacea

Cupressaceae: Biota orientalis, Chamaecyparis lawsoniana, Ch. laws. alumii, Ch. laws. erecta, Ch. laws. stewartii, Ch. laws. thuoides, Ch. pisifera, Cupressus macrocarpa, C. sempervirens, Juniperus communis, J. c. stricta, J. chinensis pfitzeriana, J. recurvata, J. sabina, J. virginiana, J. v. glauca, Thuja occidentalis, Th. o. ellwangeriana, Th. o. globosa, Th. o. malonyana, Th. o. sempervirens, Th. o. spiralis, Th. o. wareana, Th. plicata, Th. p. variegata

Ephedraceae: Ephedra distachya
Ginkgoaceae: Ginkgo biloba
Pinaceae: Abies alba, A. cephalonica, A. concolor, A. c. violacea, A. insignis, A. nordmanniana, A. numilata, A. pardei, A. religiosa, A. sibirica, Larix decidua, Picea abies, P. omorika, P. orientalis, P. pungens, P. violacea, Pinus banksiana, P. bungeana, P. canariensis, P. griffithii, P. longifolia, P. mugo, P. nigra, P. peuce, P. pinea, P. pinaster, P. ponderosa, P. silvestris, P. strobus, Pseudotsuga menziesii, Tsuga canadensis
Podocarpaceae: Podocarpus falcatus
Taxaceae: Taxus baccata, T. bacc. brevifolia
Taxodiaceae: Cryptomeria japonica, Cunninghamia lanceolata, Metasequoia glyptostroboides, Sequoia sempervirens, S. wellingtonia, Taxodium distichum

ANGIOSPERMAE

Acanthaceae: Acanthus longifolius, A. spinosus*, Eranthemum nervosum, Ruellia devosiana*
Aceraceae: Acer campestre, A. cappadocicum*, A. ginnala*, A. negundo*, A. palmatum*, A. platanoides*, A. pseudoplatanus, A. rubrum*, A. saccharinum, A. tataricum**
Aizoaceae: Tetragonia tetragonoides
Alismataceae: Alisma lanceolatum, Alisma plantago-aquatica, Sagittaria sagittifolia**
Amaranthaceae: Achyranthes aureo-reticulata, Amaranthus albus, A. caudatus*, A. deflexus*, A. gangeticus*, A. retroflexus*, Celosia cristata*, Iresine lindnerii*
Amaryllidaceae: Agave leptonseacantha, Clivia miniata, Galanthus nivalis, Haemanthus catharinae, Hippeastrum vittatum, Narcissus pseudonarcissus
Anacardiaceae: Cotinus coggygria, Rhus scopolium, R. hirta**
Anemonaceae: Adonis flammea, A. vernalis, Anemonae barbulata, A. coronaria, A. cylindrica, A. japonica, A. ranunculoides, A. rivularis, Clematis alba, Cl. alpina, Cl. heracleifolia, Cl. integrifolia, Cl. recta, Cl. vitalba, Hepatica nobilis, Pulsatilla grandis, P. hungarica, P. nigricans, P. pratensis, P. rubra, Ranunculus arvensis, R. cassubicus, R. polyanthemos, R. repens, R. sceleratus, Thalictrum adiantifolium, Th. flavum, Th. lucidum*
Apiaceae: Aegopodium podagraria, Anethum graveolens, Anthriscus cerefolium*, A. scandicina, A. silvestris, Bupleurum rotundifolium*, Caucalis lappula*, Chaerophyllum aromaticum, Danaa cornubiensis, Daucus carota*, Eryngium campestre*, E. planum*, Falcaria vulgaris*, Heracleum sphondylium, Laserpitium latifolium*, Libanotus transcaucasica, Orlaya grandiflora*, Pastinaca sativa, Petroselinum crispum, Peucedanum cervaria, Pimpinella anisum, P. major, Sanicula europaea, Seseli gummiferum, S. libanotis, S. osseum, Sium latifolium, Torilis japonica*
Apocynaceae: Catharanthus roseus, Nerium oleander, Vinca herbacea, V. major, V. minor**
Aquifoliaceae: Ilex aquifolium, Il. caprifolium
*Araceae: Aglaonema illustris, Arum maculatum, Zanthedeschia aethiopica**
Araliaceae: Fatshedera lizei, Fatsia, japonica, Hedera helix**
Aristolochiaceae: Aristolochia clematitis, A. durior, Asarum europaeum**
Asclepiadaceae: Asclepias syriaca, Cynanchum medium, Cy. nigrum, Cy. pannonicum, Cy. vincetoxicum**
Asteraceae: Achillea ageratum, A. asplenifolia*, A. kitaibeliana*, A. millefolium, A. nobilis, A. setacea, A. tanacetifolia, Ageratum mexicanum, Ambrosia elatior, Anaphalis margaritacea*, Antennaria dioica, Anthemis austriaca*, A. tinctoria*, Arctium lappa*, A. tomentosum, Arctotis grandis, Artemisia absinthium, A. alba, A. argentea*, A. campestris*, A. consaria, A. dracunculus, A. pontica, A. vulgaris*, Aster alpinus*, A. alp. wolffii, A. amellus*, A. dumosus*, A. illyricus*, A. japonicus*, A. likionaensis*, A. novi-belgii*, A. punctatum*, A. purdonis*, A. tongotensis*, Baccharis halimifolia, Baeria coronaria*, Bellis perennis bort., Bidens tripartitus*, Calendula officinalis*, Callistephus chinensis*, Carduus acanthoides, C. nutans, Carlina acaulis, C. vulgaris*, Centaurea axillaris*, C. banatica, C. cyanus*, C. fritschii, C. micrantha, C. minus, C. sadleriana*, C. scabiosa*, C.solstitialis*, C. spinulosa*, C. stenolepis, Chrysanthemum cinerariifolium, Ch. corymbosum*, Ch. leucanthemum*, Ch. maximum*, Ch. ochroleucum*, Ch. parthenium*, Ch. p. fl. pl., Ch. vulgare, Cicerbita muralis, Cichorium intybus*, Cineraria maritima*, Cirsium arvense, C. oleraceum, Cnicus benedictus, Coreopsis douglasii*, C. tinctoria, Cosmos bipinnatus*, Crepis rhoeadifolia*, Cr. setosa*, Cynara scolymus, Dahlia coccinea*, D. merckii*, D. rosea*, D, variabilis, Dimorphoteca aurantiaca*, D. calendulacea, Doronicum hungaricum,*

D. orphanides, D. pardalienches, Echinacea purpurea, Echinops ritro*, Emilia flammea*, Erechtites hieracifolia, Erigeron acris, E. canadensis, E. grandiflorus*, Eupatorium cannabinum, Filago germanica, Gaillardia grandiflora, G. lorentziana, Galinsoga parviflora*, Gazania splendens*, Gnaphalium lanatum, G. luteo-album*, Helichrysum arenarium, H. bracteatum*, H. petiolatum*, Helminthia echioides, Hieracium pilosella, Homolanthus populifolius, Inula britannica*, I. ensifolia, I. helenium, I. salicina, I. spiraeifolia, Iva xanthifolia, Lactuca quercina, L. saligna, L. sativa, L. serriola, Laya elegans, L. platyglossa, Leontodon hispidus, Lindheimera texana, Lyatris graminifolia, Matricaria africana, M. caucasica, M. chamomilla, M. globifera, M. grandiflora, M. inodora, M. nigellaefolia, M. recutita, Onopordum acanthium, Petasites hybridus, Picris hieracioides*, Pyrethrum carneum, P. parthenifolium, Rudbeckia bicolor, R. hirta, R. maxima, R. newmanii, Santolina chamaecyparissus, S. viridis, Sanvitalia procumbens*, Schkuria abrotanoides, Scolymus maculatus, Scorzonera cana, S. laciniata, Senecio doria*, S. jacobaea, S. nemorensis, S. viscosus, S. vulgaris, Serratula lycopifolia, S. radiata, S. tinctoria*, Solidago serotina*, S. trachystachys, S. virga-aurea, Sonchus asper*, S. oleraceus*, Stenactis annua, Tagetes erectus, T. patulus*, T. tenuifolius*, Taraxacum officinale, Telekia speciosa, Tragopogon dubius, T. floccosus*, T. orientalis, Tussilago farfara*, Ursinia anthemoides*, Verbesina echioides*, Xanthium italicum*, X. spinosum*, Zinnia elegans, Z. haageana, Z. peruviana*

Balsaminaceae: Impatiens balfourii, I. balsamina, I. glandulifera, I. parviflora*

Begoniaceae: Begonia rex, B. semperflorens**

Berberidaceae: Berberis brachypoda, B. juliannae, B. silvatarancana, B. thunbergii, B. vulgaris, Epimedium niveum*, Mahoberberis neubertii, Mahonia aquifolium*

Betulaceae: Alnus glutinosa, A. rubra, A. rugosa, Betula pendula, B. pubescens, Carpinus betulus*, Corylus avellana*, C. colurna**

Bignoniaceae: Campsis radicans, Catalpa bignonioides*, C. crusoscos, Incarvillea sinensis*, Jacaranda mimosaefolia*

Boraginaceae: Alkanna tinctoria, Anchusa italica, A. officinalis*, Asperugo procumbens, Borago officinalis, Cerinthe minor, Cynoglossum hungaricum*, C. officinale, Echium vulgare*, Ehretia dixoni*, E. thyrsiflora*, Heliotropium peruvianum, Lappula myosotis*, Lindelophia longifolia, Lithospermum arvense, L. officinale, L. purpureo-coeruleum*, Myosotis hispida, M. laxa, M. micrantha*, Nonea pulla*, Onosma visianii, Pulmonaria mollissima, P. officinalis, Symphytum officinale, S. tuberosum, Tournefortia heliotropioides*

Brassicaceae: Alliaria officinalis, Alyssum alyssoides*, A. benthami, A. boreale, A. ferdinandi-cobourgi*, A. murale, Arabis sieboldi*, A. turrita*, A. vachinensis*, Armoracia lapathifolia*, Barbarea vulgaris, Berteroa incana*, Calepina irregularis*, Capsella bursa-pastoris*, Cardamine impatiens, Cheiranthus albioni, Ch. cheirii, Crambe maritima, C. tataria, Dentaria bulbifera, D. enneaphyllos, D. glandulosa, Diplotaxis tenuifolia, Draba muralis, Erophila verna, Erysimum allionii, E. arbantanum, E. aureum, E. cuspidatum, E. diffusum, E. dubium, E. erysimoides, E. hieracifolium, E. lepidifolium, E. lissifolium, E. odoratum, E. officinale, E. parmonicum, E. perfoliatum, E. pyrenaicum, E. wahlenbergii, E. wittmannii, Hesperis tristis, Iberis amara, I. sempervirens, Isatis aleppica, I. glauca, I. tinctoria, I. trachycarpa, Lepidium campestre, L. cartilagineum, L. draba, L. perfoliatum, Myagrum peltatum, Raphanus sativus, Rorippa austriaca, R. islandica, R. silvestris, R. s. kerneri, Sinapis arvensis*, Sisymbrium osculare, S. sophia, Thlaspi perfoliatum, Turritis glabra*

Butomaceae: Butomus umbellatus

*Buxaceae: Buxus microphyllus, B. sempervirens**

Caesalpiniaceae: Cercis chuadentis, C. siliquastrum*, Gleditsia triacanthos, Gymnocladus dioica**

Calycanthaceae: Calycanthus occidentalis, Chimonanthus fragrans, Ch. praecox*

Campanulaceae: Campanula bononiensis, C. hemulanae, C. patula, C. persicifolia, C. rapunculoides, C. rotundifolia, Platycodon grandiflorum*

Cannabinaceae: Cannabis sativa, Humulus lupulus*

Caprifoliaceae: Leycesteria formosa, Lonicera americana, L. caprifolium, L. chactocarpa, L. flava, L. periclimena, L. pileata, L. tatarica, Sambucus canadensis, S. ebulus, S. nigra, S. pubens, S. racemosa, Symphoricarpus racemosus, Viburnum lantana, V. opulus roseum, V. rhitidophyllum*, Weigelia praecox*

Caryophyllaceae: Agrostemma githago, Cerastium anomalum, C. biebersteinii*, C. glomeratum, C. lanatum*, C. pumilum, C. vulgatum, Cucubalus baccifer, Dianthus chinensis, D. collinus, D. pontederae, D. serotinus*, D. superbus*, Gypsophila muralis, G. paniculata*, Herniaria glabra, Lychnis chalcedonica, L. coronaria, L. flos-cuculi, Melandrium album*, M. silvestre, Minuartia caespitosa, Sagina subulata, Saponaria ocymoides*, S. officinalis*, Silene cucubalus*,*

S. dichotoma, S. multiflora, S. otites, Spergularia marginata, Stellaria aquatica, S. holostea, S. media, Tunica saxifraga, Viscaria vulgaris**

Casuarinaceae: Casuarina equisetifolia

Celastraceae: Euonymus europaeus, E. japonicus, E. radicans*, E. sachalinensis*, E. verrucosa**

Ceratophyllaceae: Ceratophyllum demersum

Cercidiphyllaceae: Cercidiphyllum japonicum

Chenopodiaceae: Atriplex hastata, A. nitens, A. patula, A. tatarica, Camphorosma annua, C. ovata, Chenopodium album*, Ch. ambrosoides, Ch. anthelminticum, Ch. bonus-henricus*, Ch. botryoides*, Ch. glaucum*, Ch. hybridum*, Ch. nazicum*, Ch. opulifolium*, Ch. schroederianum, Hablitzia tamusides, Kochia scoparia, Salsola kali**

Cistaceae: Fumana vulgaris, Helianthemum ovatum**

Commelinaceae: Commelina coelestis, Tradescantia grant, T. reflexa*, T. virginiana**

Convolvulaceae: Calystegia sepium, Convolvulus arvensis*, C. cantabricus*, C. tricolor*, Cuscuta campestris, C. obtusiflora*, Nolana prostrata*

*Cornaceae: Cornus baylei, C. mas, C. sanguinea**

Crassulaceae: Crassula patula, Sedum acre, S. album, S. maximum, S. rupestre, Sempervivum marmoreum

Cucurbitaceae: Benincasa cerifera, Bryonia alba, B. dioica, Bryonopsis laciniosa, Colocynthis citrullus, Cucurbita pepo, Ecballium elaterium, Lagenaria siceraria, Luffa cylindrica*

Cyperaceae: Bolboschoenus maritimus, Carex pseudocyperus, Holoschoenus romanus, Schoenoplectus lacustris

*Dioscoreaceae: Dioscorea macrona, Tamus communis**

Dipsacaceae: Cephalaria alpina, Dipsacus silvester, Knautia arvensis, K. drymeia, Morina longifolia*, Scabiosa ochroleuca*, Succisa pratensis*

Ebenaceae: Diospyros lotus

Eleagnaceae: Eleagnus angustifolia, E. commutata*, Hippophaë rhamnoides*

Ericaceae: Calluna vulgaris, Vaccinium myrtillus

Euphorbiceae: Acalypha hispida, Andrachne colchica, Euphorbia amygdaloides, E. cyparissias, E. esula, E. gregersii, E. lucida var. salicifolia, E. palustris, E. polychroma, E. salicifolia, E. seguieriana, E. virgata, Mercurialis perennis, Ricinus communis*

Fabaceae: Amorpha fruticosa, Anthyllis vulneraria, Astragalus cicer*, A. glyciphyllus*, A. gummifera, A. onobrychis*, Baptisia tinctoria*, Caragana arborescens, C. frutex*, Colutea arborescens*, Coronilla emerus*, C. varia*, Cytisus nigricans, C. ratisbonensis, C. supinus, Dorycnium sericeum, Galega officinalis, Genista germanica, G. pilosa, G. tinctoria, Glycirrhiza echinata*, G. glabra, Indigofera splendens, Laburnum anagyroides, Lathyrus megalanthus, L. pratensis, L. tuberosus*, L. vernus*, Lotus corniculatus, Medicago falcata, M. lupulina, M. prostrata, M. sativa*, Melilotus albus, M. officinalis*, Onobrychis viciaefolia, Ononis spinosa*, Phaseolus vulgaris, Robinia ambigua, R. pseudo-acacia, Securigera ramiflora, S. suffruticosa, Sophora japonica*, Tetragonolobus siliquosus, Trifolium agrarium, T. alpestre, T. arvense, T. campestre, T. fragiferum, Tr. montanum, T. ochroleucum, T. pratense, T. repens, T. rubens, Vicia dumetorum, V. grandiflora, V. birsuta, V. lalhyroides, V. picta*, V. pratensis, V. saepium, Wistaria sinensis*

Fagaceae: Castanea sativa, Fagus silvatica*, Quercus alba, Q. borealis, Q. b. maxima, Q. cerris, Q. lyrata, Q. macrocarpa*, Q. petraea*, Q. primus*, Q. pubescens, Q. robur*, Q. r. fastigiata*, Q. rubra, Q. turneri pseudoturneri**

Gentianaceae: Blackstonia acuminata, Centaurium vulgare*, Gentiana pneumonanthe, G. tibetica**

Geraniaceae: Erodium cicutarium, Geranium echinatum, G. phaeum, G. robertianum, G. sanguineum, Pelargonium grandiflorum**

Gesneriaceae: Isoloma hirsutum, Saintpaulia ionantha

Grossulariaceae: Ribes americanum, R. aureus, R. nigrum, R. uva-crispa

Hamamelidaceae: Hamamelis japonica, Parrotia persica*

Helleboraceae: Aconitum anthora, A. lycoctonum, Actaea spicata, Aquilegia alpina*, A. canadensis*, A. chrysantha, A. japonica*, A. kitaibelii, A. sibirica*, A. vulgaris, Caltha palustris, Consolida ajacis, C. cashmirianum, C. orientalis, C. regalis, Delphinium cultorum, Helleborus dumetorum, H. odorus*, H. purpurascens, Isopyrum thalictroides, Nigella arvensis*, N. damascena**

Hippocastanaceae: Aesculus carnea, A. hippocastanum, A. parviflora**

Hydrangeaceae: Hydrangea opuloides hort., Philadelphus coronarius*

Hydrocharitaceae: Hydrocharis morsus-ranae, Vallisneria spiralis*

Hypericaceae: Hypericum hircinum, H. moschatum*, H. olympicum, H. perforatum*

Iridaceae: Crocus variegatus, Gladiolus gandavensis, Iris flavescens, I. lutea, I. pseudacorus, I. tenuifolia, I. versicolor

Juglandaceae: Carya illinoiensis, Carya ovalis, C. peau, Juglans nigra, J. regia, Pterocarya stenoptera*

Lamiaceae: Ajuga chamaepytis, A. genevensis*, A. reptans*, Ballota africana, B. nigra*, B. pseudodictamnus, Coleus scutellarioides*, Dracocephalus nutans*, D. moldavicus*, D. rupestre*, Galeopsis pubescens, Glechoma hederacea, Horminum pyrenaicum*, Hyssopus officinalis*, H. o. fl. alba, H. o. fl. rosea, H. o. seravehanicus, Lallemantia iberica, Lamium amplexicaule, L. galeobdolon, L. maculatum, L. purpureum, Lavandula angustifolia, L. dentata, L. latifolia, L. officinalis, L. spica, L. vera, Leonurus cardiaca, L. sibiricus, L. villosus, Lycopus exaltatus*, Majoranna hortensis, Marrubium endidissimum, M. peregrinum, M. vulgare, Melissa officinalis*, Melittis melissophyllum, Mentha arvensis, M. crispa, M. gentilis, M. longiflora, M. piperita, M. rotundifolia, M. verticillata*, Monarda didyma*, M. pectinata*, Nepeta mussinii, Ocymum basalicum, O. carnosum, O. comosum, Origanum majoranna, O. vulgare*, Perilla frutescens, P. ocymoides, Perowskia abratanioides, Physostegia virginiana alba*, P. v. violacea, Prunella crepis, P. vulgaris*, Rosmarinus officinalis, Salvia argentea, S. austriaca, S. glutinosa, S. jurischichii*, S. nemorosa*, S. nutans, S. officinalis*, S. pratensis, S. sclarea, S. splendens, S. verbenacea, S. verticillata*, S. virgata, Satureja acinos, S. hortensis, S. silvatica, S. vulgaris, Sideritis montana*, Stachys alpina, S. annua, S. officinalis, S. palustris, S. recta, Teucrium montanum*, Thymus glabrescens, T. marschallianus, T. vulgaris*

Lauraceae: Laurus nobilis

Liliaceae: Allium cepa, A. montanum, A. rubrum*, A. scorodoprasum*, A. ursinum*, Aloe arborescens, Anthericum ramosum, Asparagus officinalis*, A. pseudoscaber*, Aspidistra elatior, Chlorophytum comosum, Colchicum autumnale*, Convallaria majalis, Fritillaria imperialis*, Hemerocallis flava*, H. fulva, Hosta coerulea*, H. plantaginea, Hyacinthus orientalis, Kniphofia hybrida, K. pumila, Lilium martagon*, Majanthemum bifolium, Muscari comosum*, M. racemosum, Ornithogalum boucheanum, O. gussonei, O. umbellatum, Paris quadrifolia, Polygonatum latifolium, P. multiflorum, P. odoratum*, Rhodea japonica, Ruscus aculeatus, R. hypoglossus, Scilla bifolia, Tulipa hortensis, Veratrum album, V. nigrum, Yucca aloifolia, Y. filamentosa*

Linaceae: Linum austriacum, L. catharticum, L. grandiflorum, L. perenne, L. usitatissimum

Lobeliaceae: Lobelia erinus

Loganiaceae: Buddleia davidii

Lythraceae: Lythrum hysoppifolium, L. salicaria, L. virgatum

Magnoliaceae: Liriodendron tulipifera, Magnolia kobus, M. liliiflora*, M. purpurea, M. soulangeana**

Malvaceae: Abutilon avicennae, Althaea annua, A. kurdica, A. officinalis*, A rosea, A. r. nigra, A. sulphurea, A. taurinensis, Hibiscus syriacus*, H. trionum, Lavatera thuringiaca, L. trimestris*, Malva alcea, M. mauritanica, M. neglecta*, M. silvestris*, Sida hermaphroditica, Sidalcea neomexicana**

*Meliaceae: Cedrela sinensis**

Mimosaceae: Acacia verticillata

*Moraceae: Broussenetia papyrifera, Ficus australis, F. capensis, F. carica, F. elastica, Maclura aurantiaca, Morus alba, M. a. pendula, M. nigra**

Myrsinaceae: Myrsine africana

Myrtaceae: Eugenia myrtiflora, Eucalyptus rostratus, Homoranthus populifolius, Myrtus bullata, M. communis

Nyctaginaceae: Mirabilis jalapa, M. longiflora*

Nymphaeaceae: Nelumbo speciosa, Nymphaea alba**

Oenotheraceae: Chamaenerion angustifolium, Circaea lutetiana, Clarkia elegans*, Epilobium parviflorum*, Godetia amoena*, G. rubicunda*, Lopezia coronata, Oenothera acaulis, O. biennis, O. lamarckiana*, O. muricata**

Oleaceae: Fontanesia fortunei, Forsythia intermedia, F. viridissima, Fraxinus excelsior, F. e. pendula, F. ornus*, F. pennsilvanicus*, Jasminum humile, Ligustrum ovalifolium, L. vulgare, Syringa josikae, S. penkinensis*, S. vulgaris*

*Orchidaceae: Orchis coriophora, O. laxiflora elegans, Platanthera bifolia**

*Oxalidaceae: Oxalis acetosella, O. stricta**

Paeoniaceae: Paeonia banatica, P. delawar, P. officinalis*, P. potaninii*, P. suffruticosa*, P. trolloidea*

Pandanaceae: Pandanus veitchii

Papaveraceae: Bocconia cordata, Chelidonium laciniatum, Ch. majus, Corydalis sempervirens, C. solida, Dicentra spectabilis, Dicranostigma franchetiana*, Escholtzia californica*, E. stantonii, Fumaria officinalis, F. schleicheri, F. vaillantii*, Glaucium corniculatum, G. flavum*, Papaver bracteatum*, P. croceum, P. dubium, P. nudicaule, P. rhoeas*

Passifloraceae: Passiflora coerulea, P. violacea

Phytolaccaceae: Phytolacca americana

Piperaceae: Peperomia camelifolia, P. marmorata, Piper ornatum

Pittosporaceae: Pittosporum bicolor, P. cranifolum, P. undulata, P. tobira

Plantaginaceae: Plantago altissima, P. indica, P. lanceolata, P. major, P. maritima, P. media, P. schwarzenbergiana, P. tibetica

Platanaceae: Platanus acerifolius, P. occidentalis

Plumbaginaceae: Armeria humilis, A. vulgaris, Limonium gmelini, L. sinuatum, Plumbago europaea**

Poaceae: Bromus mollis, B. sterilis, B. tectorum, Dactylis glomerata, Echinochloa crus-galli, Elymus arenarius glaucus, Festuca pseudovina, Melica uniflora, Milium effusum, Phragmites communis, Phyllostachys viridiglaucescens, Poa bulbosa, P. pratensis, Stipa pennata*

Polemoniaceae: Gilia tricolor, Phlox paniculata, Polemonium carneum, P. coeruleum, P. pulcherrimum*

Polygalaceae: Polygala comosa, P. vulgaris

Polygonaceae: Emex spinosa, Fagopyrum baldschuanicum, F. tataricum, F. vulgare, Polygonum aviculare, P. convolvulus, P. lapathifolium*, P. minus*, P. persicaria, Rheum palmatum, Rh. weblianum, Rumex acetosa, R. acetosella, R. conglomeratus, R. crispus, R. limonus, R. obtusifolius, R. sanguineus*

*Pontederiaceae: Eichornia crassipes**

Portulaccaceae: Portulacca oleracea

Primulaceae: Anagallis arvensis, A. femina*, Cyclamen purpurascens, C. persicum, Lysimachia nummularia, L. punctata, L. vulgaris, Primula darialica, P. elatior, P. kewensis, P. malacoides, P. obconica, P. veris, P. vulgaris*, Samolus valerandi*

*Punicaceae: Punica granatum**

Resedaceae: Reseda glauca, R. lutea, R. odorata, R. phyteuma

Rhamnaceae: Ceanothus coeruleus, Frangula alnus*, Hovenia dulcis*, Rhamnus cathartica, Rh. daburica, Rh. imeretina*

Rosaceae: Agrimonia eupatoria, Amelanchier canadensis, Amygdalus communis, A. triloba, Armeniaca vulgaris, Aruncus silvestris, Cerasus avium, C. glandulosa, C. mahaleb, C. vulgaris, C. yedoensis*, Chaenomeles japonica*, Cotoneaster horizontalis, C. tomentosa, Crataegus crus-galli, Cr. macracantha, Cr. monogyna*, Cr. orientalis*, Cr. oxyacantha, Cydonia oblonga*, Filipendula ulmaria, F. vulgaris*, Fragaria indica, Fr. vesca*, Geum urbanum*, Kerria japonica*, Laurocerasus officinalis*, Malus baccata, M. floribunda, M. prunifolia, M. pumila, M. purpurea, M. sargentii*, Mespilus germanicus*, Neviusa alabamensis*, Padus avium, P. serotina, Persica vulgaris, Physocarpus opulifolius, Potentilla alba, P. anserina, P. arenaria*, P. heptaphylla, P. argentea, P. erecta, P. micrantha, P. nepalensis*, P. recta*, Prunus cerasifera, P. spinosa, Pyracantha coccinea, P. crenulata, Pyrus communis, P. pyraster*, Rhodotypus scandens, Rosa pendulina, R. canina, R. rugosa, Rubus caesius*, R. idaeus, Sanguisorba minor*, S. officinalis*, Sorbus aria, S. aucuparia*, S. dacica, S. torminalis*, Spiraea arguata*, Sp. revisii, Sp. vanhouttii, Sp. watsoniana, Waldsteinia geoides**

Rubiaceae: Asperula azurea, A. cynanchica*, A. heterophylla*, A. odorata*, Cruciata ciliata, Galium aparine, G. mollugo, G. rubioides, G. schultesii, G. verum*

Rutaceae: Citrus bisiruni, C. limonum, C. grandis, Dictamnus albus, Phellodendron amurense, Poncirus trifoliata, Ptelea trifoliata, Ruta chlapensis, R. divaricata, R. graveolens*, R. macrophylla, R. montana, Skimmia japonica**

Salicaceae: Populus alba, P. canadensis, P. deltoides, P. geneva, P. grandidentata, P. lasiocarpa, P. marylandica, P. nigra, P. serotina, P. simonii, P. tremula, P. virginiana, Salix acutifolia, S. adenophylla, S. alba, S. amygdalina, S. aquatica, S. cinerea*, S. daphnoides, S. purpurea*

Santalaceae: Thesium ramosum

*Sapindaceae: Koelreuteria paniculata, Xanthoceras sorbifolium**

Saxifragaceae: Bergenia bifolia, Heuchera americana, H. macrophylla, Saxifraga aizon, S. bulbifera, S. tridactylites*

Scrophulariaceae: Alonsoa caulialata, Anthirrinum majus*, Calceolaria gracilis, Chaenorrhinum minus*, Collinsia grandiflora*, Digitalis amandina, D. ambigua*, D. bonata, D. ferruginea, D. glutinosa*, D. grandiflora, D. lutea, D. orientalis, D. parviflora*, D. purpurea*, D. sibirica, D. lati-vitifolia, Euphrasia variegata*, Gratiola officinalis, Kickxia elatine, Linaria amethistina, L. genistifolia*, L. vulgaris*, Melampyrum sp., Mimulus cardinalis, M. cupreus, M. luteus*, Nemesia floribunda, N. strumosa*, N. versicolor* Odontites rubra, Paulownia tomentosa*, Pentstemon azureus*, P. barbata, P. barettae*, P. cobeae, P. coccineus, P. digitalis, P. hybridum, Rhinanthus minor, Scrophularia nodosa*, Scr. scopolii*, Scutellaria altissima, Verbascum austriacum, V. blattaria, V. lychnitis*, V. phlomoides*, V. phoeniceum, V. pyramidatum, V. speciosum, V. thapsiforme, V. thapsus, Veronica anagallis-aquatica, V. anagalloides, V. arvensis, V. austriaca*, V. chamaedrys, V. hederaefolia, V. prostrata, V. spicata**

Simarubaceae: Ailanthus altissima

Solanaceae: Atropa belladonna, Browallia grandiflora, Hyosciamus niger, Lycium halimifolium, Nicotiana affinis*, N. tabacum, Nierenbergia sp.*, Petunia hybrida*, P. inflata*, Physalis alkekengi, Ph. francheti, Salpiglossis sinuata, Schizanthus pinnatus*, Solanum capsicestrum*, S. dulcamara, S. laciniatum, S. luteum, S. melongena, S. nigrum, S. tuberosum, Withania somnifera*

Staphyleaceae: Staphylea colchica, St. pinnata**

Sterculiaceae: Lophanthus anisatus

*Styracaceae: Halesia carolina**

Tamaricaceae: Tamarix tetrandra

*Thymeleaceae: Daphne mezereum**

Tiliaceae: Sparmannia africana, Tilia cordata, T. platyphyllos, T. argentea

*Tropaeolaceae: Tropaeolum majus**

Typhaceae: Typha angustifolia

Ulmaceae: Celtis australis, C. occidentalis, Ulmus americana, U. laevis, U. minor, U. scabra*

Urticaceae: Parietaria officinalis, Pellonia argentea, Pilea frondosa, P. sprudeana, Urtica dioica, U. pilifera, U. urens

Valerianaceae: Valeriana officinalis, Valerianella dentata

Verbenaceae: Lantana camara, L. lilacina*, Verbena hybrida, V. officinalis, V. pulchella*, V. venosa*

Violaceae: Viola alba, V. arvensis, V. cyanea, V. hirta, V. hispida, V. lutea*, V. mirabilis, V. odorata*, V. riviniana, V. silvestris, V. tricolor*

Vitaceae: Parthenocissus inserta, P. tricuspidata, Vitis silvestris, V. vinifera

Zosteraceae: Potamogeton crispus

*Zygophyllaceae: Peganum harmala, Tribulus terrestris orientalis**

Addresses of the authors:
Dr. L. FERENCZY
Dr. J. ZSOLT
Department of Microbiology, Attila József University, H—6701 Szeged, P. O. Box 428, Hungary
Dr. JUDITH LANTOS
Public Health and Epidemiological Station, H—6701 Szeged, P. O. Box 389, Hungary